Chapter 10
Digital Games for Diagnostic Assessment of Cognitive Skills and Competences:
Literature Review and Framework

Joao Mattar
Pontifical Catholic University of São Paulo, Brazil

Viviane Marques Goi
Pontifical Catholic University of São Paulo, Brazil

ABSTRACT

This chapter is a literature review on the uses of games for assessment. Its purpose is to outline a framework for the design of digital games for the assessment of cognitive skills and competences. A model for the assessment of generic competences is initially presented. Four categories for assessment through digital games are then explored (aim, implementation, integration, and primary type), including the strategies of in-game and out-game assessment. Methodological questions are then raised, involving approaches for linking the types of actions performed by the players during the game to a knowledge domain, tests for cognitive assessment, and adaptive assessment. As solutions, recommendations, and suggestions for future research a model is proposed to guide the design and development of digital games that aim to assess cognitive skills and competences, named DACSC.

INTRODUCTION

This article presents a review of the literature on the use of digital games for assessment. The main research question is: how should digital games be designed to properly assess cognitive skills and competences? The following hypotheses were elaborated at the beginning of the research: (a) digital games have been successfully used in the assessment of cognitive skills and competences, and (b) digital games must have specific characteristics to properly assess players' cognitive skills and competences.

The research is justified by several reasons: (a) the relevance that the results of cognitive assessment might have on the teaching and learning process, (b) the increasing incorporation of digital games into education, and (c) the need for technological tools to support the development of the field of learning assessment.

The second section introduces the theoretical concepts and references that are used as background for the chapter. The third section explains the methodology used in the literature review, while the fourth section presents a narrative review of the selected texts. The fifth section specifically discusses the main theme of the chapter — the use of digital games for diagnostic assessment of cognitive skills and competences — and is divided into three subsections. The first subsection presents a model for the assessment of generic competences; the second subsection explores different types of assessments in this configuration, including perspectives from inside and outside of the game; then, different methodologies for the assessment of skills and competences through digital games are described and analyzed, questioning also how it is possible to assess the cognitive abilities of the player taking into consideration his actions. Solutions and recommendations are then proposed for the development of digital games aimed at the assessment of cognitive skills and competences, as well as suggestions for future research in the area. The Conclusion summarizes the text, points out the aspects in which the chapter collaborated in the area and its limitations.

One objective of this chapter is to present the state of the art on the use of digital games for the assessment of cognitive skills and competences. In this sense, based on the literature review, it intends to present a framework to guide the design and development of digital games that aim to diagnose and assess cognitive skills and competences.

BACKGROUND

One of the challenges faced by contemporary education institutions is to teach students in a way that they can mobilize the knowledge gained during the learning process into new and unpredictable situations, preparing them for real life: the challenge of building skills and transferring knowledge. Because of that, competence-based (and not only knowledge-based) approaches are today part of the curriculum worldwide. The Bologna Declaration (1999) is an example of that emphasis on competences in the Higher Education sector of European countries.

Perrenoud (2011a, 2011b, 2013) is an international authority on the discussion of competences in education. The Swiss sociologist understands competence as the capacity of mobilizing a set of cognitive resources (not only knowledge but also information, abilities, skills, etc.) to deal with practical and complex situations. Competences, which would be applied when a novelty, an unforeseen event, or a problem occurs, is sometimes differentiated not only from knowledge and attitudes but also from skills, which would be applied in better known or controlled situations. This chapter does not differentiate among abilities, skills, and competences, but these concepts are conceived differently from the pure and theoretical knowledge that is not easily transferable to reality, as this transfer requires the integration of knowledge and skills. This research is also not interested in social and personal competences (such as values and attitudes) but in methodological competences (know-how). Examples of these kinds of competences would be: to analyze relationships and to understand, apply, and elaborate rules.

Related Content

The Game Space of Dear Esther and Beyond: Perspective Shift and the Subversion of Player Agency
Harrington Weihl (2016). *Examining the Evolution of Gaming and Its Impact on Social, Cultural, and Political Perspectives (pp. 73-94).*
www.irma-international.org/chapter/the-game-space-of-dear-esther-and-beyond/157617

The Design and Development of Educational Immersive Environments: From Theory to Classroom Deployment
Collin B. Priceand Miss J.S. Moore (2010). *Gaming for Classroom-Based Learning: Digital Role Playing as a Motivator of Study (pp. 24-43).*
www.irma-international.org/chapter/design-development-educational-immersive-environments/42685

Automated Event Recognition for Football Commentary Generation
Maliang Zhengand Daniel Kudenko (2010). *International Journal of Gaming and Computer-Mediated Simulations (pp. 67-84).*
www.irma-international.org/article/automated-event-recognition-football-commentary/47206

A Tripartite Evolutionary Game Model for Chinese-Style Education Investment in ASEAN Under Local Government Policy
Zheqi Zhuand Kun Zhai (2024). *International Journal of Gaming and Computer-Mediated Simulations (pp. 1-24).*
www.irma-international.org/article/a-tripartite-evolutionary-game-model-for-chinese-style-education-investment-in-asean-under-local-government-policy/336839

Assistive Systems for the Workplace: Towards Context-Aware Assistance
Oliver Korn, Markus Funkand Albrecht Schmidt (2015). *Gamification: Concepts, Methodologies, Tools, and Applications (pp. 1936-1949).*
www.irma-international.org/chapter/assistive-systems-for-the-workplace/126151